WHAT IS CLAIMED IS:

1. A reading system comprising:

a light source for directing a light beam into a grating-based waveguide sensor; and

a detector for receiving a reflected light beam from the grating-based waveguide sensor that was tuned to have a resonance at a predetermined spectral location by adjusting a skew angle defined as an angle between a plane of incidence of the light beam directed into the grating-based waveguide sensor and a grating vector which is perpendicular to lines of a diffraction grating within the grating-based waveguide sensor, wherein said detector is used to analyze the reflected light beam so as to detect a resonant condition which corresponds to a predetermined refractive index that indicates whether a biological substance is located on a surface of the grating-based waveguide sensor.

2. The reading system of Claim 1, wherein said biological substance is a cell, molecule, protein, drug, chemical compound, nucleic acid, peptide or carbohydrate.

3. The reading system of Claim 1, wherein said detector utilizes an angular interrogation approach to analyze the reflected light beam and enable the detection of an resonant angle which indicates whether the biological substance is located on the surface of the grating-based waveguide sensor.

4. The reading system of Claim 1, wherein said detector utilizes a spectral interrogation approach to analyze the reflected light beam and enable the detection of a resonant wavelength which indicates whether the biological substance is located on the surface of the grating-based waveguide sensor.

5. The reading system of Claim 1, further comprises a plurality of grating-based waveguide sensors wherein each of the grating-based waveguide sensors is tuned to

have a resonance at a predetermined spectral location by adjusting the respective skew angle which enables spectral multiplexing of a plurality of the reflected light beams.

6. The reading system of Claim 1, wherein said skew angle is adjusted by rotating the grating-based waveguide sensor while maintaining the angle of the plane of incidence of the light beam emitted from said light source.

7. The reading system of Claim 1, wherein said skew angle is adjusted by moving the angle of the plane of incidence of the light beam emitted from said light source while maintaining the position of the grating-based waveguide sensor.

8. The reading system of Claim 1, wherein said skew angle is adjusted to correct a manufacturing defect in the grating-based waveguide sensor.

9. A reading system capable of performing a multiplexed interrogation of an array of grating-based waveguide sensors, said reading system comprising:

a light source;

at least one collimator lens, each collimator lens capable of directing a light beam emitted from said light source into one of the grating-based waveguide sensors and further capable of receiving a reflected light beam from the one grating-based waveguide sensor, wherein each of the grating-based waveguide sensors was tuned to have a resonance at a desired spectral location by adjusting a skew angle (□) defined by the equation:

$$\sin\theta\cos\delta = n_{eff} - \frac{\lambda}{\Lambda}$$

where θ is an angle of incidence of the respective light beam, n_{eff} is the index of refraction of the grating-based waveguide sensors, λ is the wavelength of the respective light beam;

a dispersive device capable of receiving a plurality of the reflected light beams from said collimating lenses and further capable of detecting a resonant wavelength/angle in the respective reflected light beams which corresponds to a predetermined refractive index that indicates whether a

biological substance is located on a surface of the respective grating-based waveguide sensor.

10. The reading system of Claim 9, wherein said biological substance is a cell, molecule, protein, drug, chemical compound, nucleic acid, peptide or carbohydrate.

11. The reading system of Claim 9, wherein said dispersive device is a spectrometer.

12. The reading system of Claim 9, wherein each skew angle is adjusted by rotating an angle of the plane of incidence of the light beam emitted from said respective collimating lens while maintaining the position of the respective grating-based waveguide sensor.

13. The reading system of Claim 9, wherein said grating-based waveguide sensors are tuned to have spectral locations that are separated from one another a predetermined distance to enable said dispersive device to detect the presence of the biological substance located on the surface of any one of the set of grating-based waveguide sensors.

14. A method for interrogating one or more grating-based waveguide sensors, said method comprising the steps of:

directing a light beam into each grating-based waveguide sensor;

receiving a reflected light beam from each grating-based waveguide sensor; and

analyzing each received reflected light beam to detect a resonant condition which corresponds to a predetermined refractive index that indicates whether a biological substance is located on a surface of the respective grating-based waveguide sensor, wherein each grating-based waveguide sensor was tuned to have a resonance at a predetermined spectral position by adjusting a skew angle defined as an angle between a plane of incidence of the light beam directed into that grating-based

waveguide sensor and a grating vector which is perpendicular to lines of a diffraction grating within that grating-based waveguide sensor.

15. The method of Claim 14, wherein said biological substance is a cell, molecule, protein, drug, chemical compound, nucleic acid, peptide or carbohydrate.

16. The method of Claim 14, wherein said analyzing step utilizes an angular interrogation approach to analyze each reflected light beam and enable the detection of an resonant angle which indicates the presence of the biological substance on the surface of each grating-based waveguide sensor.

17. The method of Claim 14, wherein said analyzing step utilizes a spectral interrogation approach to analyze each reflected light beam and enable the detection of a resonant wavelength which indicates the presence of the biological substance on the surface of the each grating-based waveguide sensor.

18. The method of Claim 14, wherein each skew angle was adjusted by moving the angle of the plane of incidence of the light beam while maintaining the position of the respective grating-based waveguide sensor.

19. The method of Claim 14, wherein each skew angle was adjusted by rotating the respective grating-based waveguide sensor while maintaining the angle of the plane of incidence of the light beam.

20. The method of Claim 14, wherein said grating-based waveguide sensors are interrogated by multiplexing a predetermined number of reflected light beams.

21. The method of Claim 14, wherein said grating-based waveguide sensors are located in wells formed within a microplate.

22. A microplate comprising:

a frame including a plurality of wells formed therein, each well incorporating a grating-based waveguide sensor that was tuned to have a resonance at a desired spectral location by adjusting a skew angle (□) defined by the equation:

$$\sin\theta\cos\delta = n_{eff} - \frac{\lambda}{\Lambda}$$

where θ is an angle of incidence of a light beam directed into the grating-based waveguide sensor, n_{eff} is the index of refraction of the grating-based waveguide sensor, λ is the wavelength of the light beam.

23. The microplate of Claim 22, wherein a reading system is used to interrogate each of the grating-based waveguide sensors by:

directing a light beam into each grating-based waveguide sensor;

receiving a reflected light beam from each grating-based waveguide sensor; and

analyzing each received reflected light beam to detect a resonant condition which corresponds to a predetermined refractive index that indicates whether the presence of the biological substance is on a surface of the respective grating-based waveguide sensor.

24. The microplate of Claim 23, wherein said biological substance is a cell, molecule, protein, drug, chemical compound, nucleic acid, peptide or carbohydrate.